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DIRECTORATE OF
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Intelligence Memorandum

Soviet Purchases Of Free World Chemical Equipment In 1970

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
March 1971

INTELLIGENCE MEMORANDUM

Soviet Purchases Of Free World Chemical Equipment In 1970

Introduction

For the past several years, the Soviet Union has been buying large quantities of chemical equipment and technology from the Free World. The origins and types of equipment and technology have changed according to Soviet needs. This memorandum describes the Soviet Union's orders placed in 1970 for chemical equipment and technology from the Free World. The increased importance of the United States as a supplier of chemical process technology to the USSR is a significant development.

Recent Purchases

1. In 1970 the value of known Soviet orders for Free World chemical equipment and technology totaled $203 million, an amount exceeded only in 1964 and more than twice the value of such purchases in 1969. The 1970 orders brought the total value of contracts for Free World chemical equipment and technology concluded during the five-year period 1966-70 to $676 million. For a list of contracts concluded during 1970, see the Appendix.

2. Contracts for chemical equipment and technology in 1970 almost certainly represent a greater share of total orders for machinery and

Note: This memorandum was prepared by the Office of Economic Research and coordinated within the Directorate of Intelligence.

equipment of all kinds from the Free World than did such contracts in 1969. However, because of the time lag between purchase and delivery, the higher value of orders for chemical equipment will not be reflected in increased imports for several years. Although year-end data on Soviet imports of Free World chemical equipment during 1970 are not available, it is probable that the level of these imports declined, as it did in 1969. This decline in actual imports was the result of reduced Soviet orders for chemical equipment during 1965-67. Purchases and imports of Free World chemical equipment and technology during 1964-70 are shown in Table 1.

3. Almost 88% of the total value of contracts placed in 1970 for imports of chemical equipment from the Free World represented orders for plants to produce petrochemicals, including synthetic ammonia. Orders for such plants increased substantially in 1970, reaching $178 million compared with $32 million in 1969. Contracts for plants to produce synthetic ammonia, the basic ingredient of nitrogen fertilizers, were valued at $106 million in 1970, about 59% of the total value of orders placed in that year for imported petrochemical equipment. The remaining contracts were primarily for plants that will furnish intermediate products for use in the manufacture of plastics and synthetic rubber. The value of contracts for most other types of chemical equipment and technology declined in 1970, as is evident in Table 2.

Suppliers and Terms of Credit

4. Japan became the largest Free World seller of chemical plants and equipment to the USSR in 1970, with contracts valued at $145 million or more than 70% of the total for such Soviet-Free World contracts. This success in selling to the Soviet Union probably reflects Japan's ready access to US petrochemical and ammonia technology and Japan's willingness to offer attractive terms of credit. The sale of a butadiene plant, an ethylene plant, and four ammonia plants, all of which will rely heavily on US technology, accounted for more than 99% of the total value of Japan's chemical equipment contracts with the USSR. An eight-year credit at 5.5% interest was extended to the USSR for the purchase of the butadiene plant. The Japanese

Table 1

USSR: Orders for and Imports of Free World Machinery and Equipment for the Chemical Industry

	New Orders		Imports	
Year	Million US $	As a Percent of Total Soviet Orders for Free World Machinery and Equipment a/	Million US $	As a Percent of Total Soviet Imports of Free World Machinery and Equipment a/
1964	244	N.A.	113	31
1965	128	56	111	35
1966	123	14	147	40
1967	105	22	177	33
1968	145	27	204	27
1969	100	30	155	16
1970	203 b/	N.A.	N.A.	N.A.

a. Excluding ships and marine equipment.
b. Not including the value of Soviet orders for an acetylene installation, three plants to make and fill plastic bottles, and technology for the production of corticosteroids. The values of these contracts have not been reported.

Table 2

USSR: Orders for Chemical Equipment from the Free World, by Type

Type	Million US $ 1969	1970
Chemical fibers and intermediates	a/	22.0
Petrochemicals	32.0	178.4
Of which:		
Ammonia b/	26.0	106.0
Plastics, plastics processing, and intermediates	33.3	1.4
Rubber and rubber products	4.0	a/
Other chemical equipment	30.6	1.0 c/
Total	*99.9*	*202.8*

a. Unknown. Believed to be zero or small.
b. Ammonia plants may also appropriately be categorized as producers of agricultural chemicals.
c. Estimated sales of instruments to the USSR by Free World firms at the "Chemistry 70" exhibition in Moscow.

export-import bank granted the Soviet Union a ten-year credit at 6.25% interest for the purchase of three ammonia plants and an ethylene facility. The required 15% downpayment for this credit was loaned to the USSR by a foreign subsidiary of the principal Japanese contractor.

5. As a result of the Japanese sales, the United States will become an important supplier of chemical process technology to the USSR. US technology used in the six plants sold to the USSR

by Japan has been valued at more than $13 million. In addition, a US firm contracted directly with the USSR to supply catalyst technology, valued at $3 million, for use in the Japanese-supplied butadiene plant. The same firm also contracted with the Japanese to supply chemical equipment valued at more than $3 million for use in the butadiene plant. Thus, Soviet orders placed during 1970 resulted, directly or indirectly, in the sale by US firms of technology and equipment valued at nearly $20 million. Such contracts totaled only $2 million in 1969.

6. The share of West European suppliers in total Soviet purchases of Free World chemical equipment and technology declined sharply -- from 64% of the reported value of contracts in 1969 to about 18% in 1970. Although the European total would be somewhat higher if the value of an acetylene plant sold by West Germany were known, the decline in the European share still would be substantial. The United Kingdom experienced the sharpest decline in sales, apparently receiving no major Soviet orders for chemical equipment in 1970, whereas its share of such orders in 1969 was valued at almost $44 million. Sales by other Western countries also fell. Sales of chemical equipment and technology to the USSR in 1969 and 1970 by various Free World countries are shown in the accompanying tabulation.

	Million US $	
Country	1969	1970
Japan	34.0	145.2 a/
West Germany	b/	22.0 c/
United States	2.0	19.6 a/
France	19.4	15.0
Netherlands	b/	N.A.
United Kingdom	43.9	b/
Italy	0.6	b/
Other countries	b/	1.0 d/
Total	*99.9*	*202.8*

a. Estimated.
b. Unknown. Believed to be zero or small.
c. Excluding the sale of an acetylene plant for which no value could be estimated.
d. Estimated sales of instruments to the USSR by Free World firms at the "Chemistry 70" exhibition in Moscow.

Significance of 1970 Purchases

7. The major chemical plants purchased from the Free World by the USSR in 1970 probably will not make a significant contribution to the output of the chemical industry until 1974, or later. The Japanese-supplied butadiene plant may begin production in 1973, if construction is completed early in that year. However, previous Soviet experience with Western-supplied installations suggests that the plant will require at least one to three years to reach rated capacity. Delivery of equipment for the ammonia plants purchased from Japan in 1970 will not be completed until 1973, and output is not likely to reach significant levels until at least 1974. The ethylene plant purchased from Japan is scheduled for completion in 1975; but, after completion, several months may be required for successful start-up.

8. The Japanese ethylene plant will be much larger and more efficient than plants now operating in the USSR. Its capacity -- 450,000 tons per year -- is about 7.5 times that of the largest Soviet-designed ethylene plant. Running at capacity, it could provide enough raw material to produce 400,000 tons of polyethylene, an amount equal to almost 30% of total Soviet production of plastics in 1969. The ethylene, however, will be used to produce not only polyethylene but also polystyrene, ethylene oxide, ethyl alcohol, and synthetic rubber. In the West, increasing ethylene plant capacities from 100,000 tons to 450,000 tons per year has reduced production costs by more than 30%. Similar savings are expected in the USSR. Nikolai Fedorenko, a Soviet economist specializing in the chemical industry, has estimated that the cost of ethylene produced in a 450,000-ton plant should be 30%-35% below that of ethylene produced in the largest existing Soviet facilities. Moreover, the Japanese-supplied plant should operate more reliably than Soviet-designed facilities. A Soviet ethylene plant completed in 1966 to supply feed for a nearby polyethylene plant at Sumgait apparently has not operated regularly. In 1969 the polyethylene plant was standing idle for lack of raw materials, and in 1970 the press reported that the ethylene plant would have to undergo drastic reconstruction.

9. The four ammonia plants that the USSR purchased from Japan in 1970 will increase the output and improve the efficiency of Soviet production of ammonia, the principal ingredient of nitrogen fertilizer. Their combined annual capacity is equal to about 30% of estimated Soviet production of ammonia in 1969. The rated capacity of each of these plants is 450,000 tons per year, more than four times that of the largest Soviet ammonia production facilities now in operation. They will use a US production process based on large single-train units incorporating centrifugal compressors and an integrated energy conservation system to reduce operating costs. Computer studies will be used in the design of the plants to insure optimum operating conditions. In the West, economies of scale associated with such plants have reduced unit investment cost by 30%-40%; operating costs, primarily as a result of smaller requirements for energy, have been reduced by as much as 50%. Even if the Japanese-supplied plants do not operate as efficiently in the USSR as have similar plants in the West, they certainly will produce ammonia at substantially lower cost than do present Soviet facilities. L. A. Kostandov, Minister of the Chemical Industry, anticipates a saving of approximately 50% in unit production and investment costs from the introduction of plants of this size.

10. The butadiene plant that the USSR purchased from Japan in 1970 will be the first commercial-size plant in the Soviet Union making butadiene from butane via a single-stage process. The plant will extract butane from natural gas and will convert the butane to butadiene by the process of dehydrogenation. Unit operating and capital costs should be significantly lower than for any of the processes now used for production of butadiene in the USSR. One Soviet economist, L. I. Gramoteyeva, has indicated that the capital costs of the single-stage process should be 15%-20% less than the capital cost of the two-stage process now used and that operating costs should be 35%-40% less. Butadiene is used in the production of polybutadiene, a type of synthetic rubber that can replace natural rubber in the manufacture of tires. At present, imports of natural rubber account for about 30% of the Soviet rubber supply and cost about $100 million in foreign exchange annually. In recent years,

the USSR has been attempting to reduce its dependence on imported natural rubber. The Japanese plant should make a significant contribution toward achievement of this goal. Running at capacity, it could provide enough raw material for an increase of approximately 10% in Soviet production of synthetic rubber. The new plant should also improve the quality of Soviet butadiene. In past years, much of the synthetic rubber produced in the USSR has been of poor quality, in part because of the poor quality of the butadiene used as raw material.

Prospects

11. Recent negotiations suggest that Soviet purchases of chemical equipment from the Free World probably will continue at a high level. Annual orders probably will average at least $100 million over the next three to five years. Officials of the Ministry of Foreign Trade have said that most of the funds available for importing chemical equipment will be used for the purchase of plants to support agriculture during the coming five-year plan. It is likely that plants for production of pesticides and fertilizers (particularly multinutrient fertilizers) will be high on the Soviet shopping list. The USSR plans to expand the production of fertilizers from 54 million metric tons in 1970 to 90 million tons in 1975, and the slow growth of the Soviet chemical equipment industry suggests that plants purchased from the Free World are expected to account for a significant share of this increased production. Soviet plans to increase production of petrochemicals, plastics, and synthetic rubber also probably will entail the further acquisition of Western plants and/or technology.

12. The USSR will continue its attempts to acquire plants which use US process technology. In recent years, US firms have designed and built extremely large and efficient plants which have greatly reduced the unit production costs of petrochemicals, fertilizers, and various basic chemicals, all of which are required in large volumes in the USSR. For several years Soviet engineers have been trying to develop similar technology, with only limited success. Therefore, modernization of the Soviet chemical industry on a significant scale

during 1971-75 probably will require the continued purchasing of equipment and processes from the Free World. Although plants using US process technology are most attractive, it is unlikely that the United States will substantially increase its share of equipment sales to the USSR. Japanese and European firms, which frequently ask lower prices and offer more advantageous credit terms, probably will continue to supply the bulk of the equipment for chemical plants sold to the Soviet Union. The US role will be limited primarily to providing process technology and engineering through foreign subsidiaries.

Conclusions

13. The value of Soviet orders for Free World chemical equipment and technology placed during 1970 was more than twice the value of such orders in 1969. Contracts valued at more than $200 million were concluded in 1970. Orders for plants to produce fertilizer intermediates accounted for more than one-half of the total value of contracts for Free World chemical equipment and technology.

14. Japan was the largest single Free World seller of chemical plants to the USSR during 1970, with sales of $145 million, more than 70% of the total value of Soviet-Free World chemical equipment contracts. Six of the plants sold to the USSR by Japan in 1970 will use US process technology. The sale of technology for these Japanese plants made the United States a major source of process technology for the USSR. The share of West European countries in sales to the USSR declined.

15. The plants purchased from Japan during 1970 probably will not be operating at capacity until mid-1974, at the earliest. Nevertheless, they will represent a significant share of the new capacity for production of synthetic ammonia, ethylene, and butadiene to be commissioned during 1971-75. The six plants purchased from Japan by the Soviet Union incorporate US process technology comparable to that used in modern large-scale plants being built in the Free World. In terms of size and efficiency these plants represent a great advance over plants now operating in the USSR.

16. The USSR probably will continue to purchase Free World chemical equipment and technology at the rate of at least $100 million annually for the next several years. Western production processes for many chemical products are more efficient than their Soviet counterparts. This is especially true for plants that produce fertilizers, petrochemicals, and synthetic rubber. The USSR will continue to seek process technology from US firms, but the share of the United States in equipment sales to the USSR probably will not increase substantially. Japanese and European firms offer equipment at lower prices and more attractive terms of credit than their US competitors. In the near future, the US role will remain one of providing process technology and engineering to the major Japanese and European equipment exporters.

APPENDIX

USSR: Contracts Concluded in 1970 for the Purchase of Chemical Plants and Technology from the Free World

Type of Plant or Equipment	Production Capacity (Thousand Metric Tons per Year a/)	Million US $	Exporter		Plant Site and Comments	Scheduled Completion Date
			Country	Firm		
Chemical Fibers and Intermediates						
Nylon salt	20	22.0	West Germany	BASF	Severodonetsk	1973
Petrochemicals b/						
Butadiene	90	24.4	Japan-United States	Mitsui, Toyo Engineering, and Houdry	Nizhnekamsk	1973
Ethylene	450	40	Japan-United States	Mitsui, Toyo Engineering, and Lummus	Kazan	1975
Paracresol and antioxidants	3,000 metric tons per year of paracresol. 5,000 metric tons per year of antioxidants.	5	France	Petrole Chemie, SA	N.A.	N.A.
Process technology for manufacture of catalyst used in production of butadiene		3	United States	Houdry	The USSR may not set up a plant to produce this catalyst as long as the catalyst can be imported from the United States.	N.A.
Acetylene	N.A.	N.A.	West Germany	BASF	Severodonetsk	1973

Type of Plant or Equipment	Production Capacity (Thousand Metric Tons per Year a/)	Million US $	Exporter		Plant Site and Comments	Scheduled Completion Date
			Country	Firm		
Plastics, Plastics Processing, and Intermediates						
Polyvinyl chloride	N.A.	1.4	Japan	Ishikowajima Heavy Industries Co.	N.A.	Delivery in 1971
Three plants to manufacture and fill plastic bottles	N.A.	N.A.	Netherlands	Machinenfabriek Stork	N.A.	N.A.
Agricultural Chemicals						
Ammonia	1,360 metric tons per day	26 c/	Japan-United States	Mitsui, Toyo Engineering, and Kellogg	Novomoskovsk	N.A.
Three ammonia plants	Capacity for each: 1,360 metric tons per day	70	Japan-United States	Mitsui, Toyo Engineering, and Kellogg	Novomoskovsk, Novgorod, and Severodonetsk	Equipment will be delivered in 1972 and 1973.
Ammonia plant equipment	N.A.	10	France	ENSA	N.A.	N.A.
Other Chemical Equipment						
Miscellaneous	N.A.	1.0 d/	N.A.	N.A.	N.A.	N.A.
Technology and license to produce corticosteroids	N.A.	N.A.	Italy	Pierrel SpA	N.A.	N.A.

a. Unless otherwise indicated.
b. Partial listing only. Other petrochemical installations are included with agricultural chemicals and with fibers or plastics.
c. Estimated on the basis of previous plant purchase.
d. Estimated sales of instruments to the USSR by Free World firms at the "Chemistry 70" exhibition in Moscow.